GEOLOGY.—*The detection of the Chipola fauna in the Marks Head marl.*[1] JULIA GARDNER, U. S. Geological Survey.

The proposed correlation of the Marks Head marl with the Chipola formation is based, not upon the discovery of a new fauna but upon the new interpretation of an old—that of the Marks Head marl. The Marks Head marl takes its name from Marks Head, one mile west of north of Porter's Landing on the Savannah River in Effingham County, Georgia. The name was introduced into the literature in 1908 by Earle Sloan[2] in the following section from Porter's Landing:

(a) 64.0 feet—White, yellow and red sands in stratified beds of both fine and coarse grained material.
(b) Thin broken line of vertebrate remains, and small pieces of phosphate rock.
Miocene, Edisto phase.
(c) 5.9 feet—Ledge of compact yellowish marl inclosing *Pecten eboreus*, *Ecphora quadricostata*, numerous *Anomias*, etc.
Miocene Marks Head phase.
(d) 27.0 feet—Dun-colored mass of leached marl and indurated sands inclosing many rounded concretions of carbonate of lime encasing variable amounts of sand. Some concretions more than two feet in diameter. The basal portion is a hard concretionary layer (about a half foot thick) formed along a highly irregular surface. Stratum (d) appears at the same level as the Marks Head marl at its type locality, one mile northwest.
Oligocene, Parachucla phase.
(e) 0 to 1.5 feet—Broken undulatory line of compact fine-grained sandstone; inclosing *Ostrea mauricensis*.
0 to 1.7 feet—White sands inclosing a large number of one species of *Pecten*, and numerous shell fragments.
(f) 14.0 feet—Fine grained laminated shale with sand partings. The median portion appears in the form of silicified concretions. The base includes a line of rounded pebbles.
(g) 0 to 6 feet—A much-leached marl inclosing *Carolia floridana*, Pectens, sharks teeth, ribs of Cetaceans, and a large number of small discoidal quartz pebbles.
Combahee phase
(h) Above zero level appears 0 to 8 feet of a laminated drab shale with arenaceous partings. Incloses molds of the lucinidae, and at Hudson Ferry impressions of the dwarf palmetto.

The section was later modified by Vaughan[3] to read:

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[1] Published with the permission of the Director of the U. S. Geological Survey.

[2] EARLE SLOAN, *Catalogue of the Mineral Localities of South Carolina*, South Carolina Geol. Survey., ser. iv, Bull. No. 2, page 273, 1908.

[3] T. W. VAUGHAN, *Science*, new ser., **31**: 833. 1910.

	Feet
6. Pleistocene—white red and yellow sands, with phosphatic pebbles and vertebrate fragments at the base	64
5. Miocene—compact, yellow, fossiliferous marl (Duplin horizon)	6
4. Miocene—grayish, fossiliferous marl (Marks Head marl)	29
3. Fine-grained, laminated shale with sandy partings, a line of rounded pebbles at the base	14
2. Oligocene—fossiliferous marl (Alum Bluff formation)	½
1. Laminated drab shale with arenaceous partings	8

The descriptions of the sections suggest faunal zones which are not obvious in the collections. The material sent in by Sloan and Vaughan in 1907 from the type locality at Marks Head includes *Ostrea normalis* (= *Ostrea mauricensis* auctores), the common *Pecten acanikos,* and *Carolia floridana.* The three species are also associated in bed No. 4 of Vaughan's Porter's Landing section in material sent in by him in 1909. To be sure, *Carolia floridana* is comparatively rare in the upper bed and exceedingly abundant in bed No. 2 of Vaughan, *g* of Sloan. Later collections by Stephenson in the vicinity of Porter's Landing have confirmed the association of the species in question. *Pecten acanikos* and *Carolia floridana* and *Pecten acanikos* and *Ostrea normalis* are coexistant at a number of localities in the Chipola formation in northern Florida. However, *Carolia floridana* has not been recognized at any horizon other than the Chipola, so, from an examination of the literature and the fossils, it seems that all of Sloan's Parachucla phase belongs to the Chipola epoch, and that the Marks Head fauna may be treated as a unit. The first correlation of the Porter's Landing section on the following basis was made in 1910 by T. Wayland Vaughan.[3] "The Marks Head marl, which was first named by Sloan, and is represented by bed No. 4 of the section (beds *d* and *e* of Sloan's section) contains specimens of the genus *Carolia* which suggests an Oligocene[4] age, but every other indentifiable species may be Miocene, and only three of them range downward into the Oligocene. Nine of the species are not known below the Miocene, while the presence of *Turritella aequistriata* Conrad, *Calliostoma aphelium* Dall, *Ostrea mauricensis* Gabb, and *Pecten marylandicus* Wagner, definitely point to a horizon low in the series, approximately equivalent to the Calvert formation of Maryland. This interpretation was followed by Veatch and Stephenson in the Geology of the Coastal Plain of Georgia published as Bulletin No. 26 of the Geological Survey of Georgia. C. Wythe Cooke, however, in unpublished field notes suggested a correlation of the Marks Head with the Alum Bluff on the evidence of the lith-

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[4] The lower Miocene of modern usage.

TABLE 1.—ORIGINAL DETERMINATIONS OF FOSSILS FROM THE MARKS HEAD MARL*

NAME	STRATIGRAPHIC RANGE AND OCCURRENCE	MARKS HEAD, E.S. & T.W.V.	¼ MI. ABOVE PORTER'S LANDING, L.W.S.	¼ MI. ABOVE PORTER'S LANDING, T.W.V.	PORTER'S LANDING BETWEEN CAROLIA AND O. MAURICENSIS, BEDS T.W.V.	PORTER'S LANDING, O. MAURICENSIS BED, T.W.V.	SISTERS FERRY, L.W.S.
Turritella acquistriata Conrad	Jericho, N. J.			x			
Neverita duplicata var. *percalosa* Conrad	Miocene to Recent			x			
Calliostoma aphelium Dall	Jones Wharf and Calvert Cliffs, Md.			x			
Calliostoma sp.			x	x			
Yoldia laevis Say							
Arca limula Conrad	Miocene and Pliocene	x					
Ostrea mauricensis Gabb	Eocene, Oligocene, lower Miocene of Jericho, N. J.	x	x	x		x	
Pecten marylandicus Wagner	Jones Wharf, Md. etc.	x	x	x	x		x
Carolia sp. (*floridana* Dall?)		x		x			
Mytilus conradinus d'Orb.	Throughout the Miocene	x	x	x	x		
Astarte sp. (also in the upper horizon at Porters)				x			
Venericardia perplana var. *abbreviata* Conrad	Miocene of York River to Pliocene			x			
Phacoides trisulcatus Conrad	Oligocene to Pliocene.			x			
Phacoides crenulatus (Conrad)	Miocene of Jericho, N. J., to Duplin horizon, N.C.			x			
Phacoides sp.	Jones Wharf, Md., to Duplin horizon, N. C.			x			
Cardium laqueatum Conrad				x			
Dosinia sp.				x			
Macrocallista sp.				x			
Strigilla flexuosa Say	Oligocene to Recent			x			
Strigilla carnaria (Linn.)	Hitherto only Recent			x			
Donax n. sp.			x	x			
Mactra sp. (hinge of large sp.)				x			
Spisula n.sp.			x				
Corbula n. sp.				x			
Balanus			x	x	x		

* Geological Survey of Georgia, Bull. 26, p. 365.

ology:[5] "The Marks Head marl is fine gray sand containing some nodular calcareous concretions and lenses of brittle fullers earth. It does not differ materially in appearance from the Alum Bluff formation, and I should be inclined to include it in the Alum Bluff if the paleontologic evidence is not conflicting."

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[5] C. W. COOKE, Unpublished field notes, April 22, 1922.

The fossils on which the age determination was based are very imperfect and, in the absence of a good refcrence fauna, identification would be difficult. Later detailed work upon the fauna of the Chipola formation particularly the "Sopchoppy limestone" phase, has thrown a new light upon the Marks Head fauna. The original list as published by the Georgia Geological Survey follows together with the

TABLE 2.—REVISED DETERMINATIONS OF FOSSILS FROM THE MARKS HEAD MARL

NAME	STRATIGRAPHIC RANGE AND OCCURRENCE
Turritella alcida bicarinata Gardner mss	Chipola formation ("Sopchoppy limestone") and Oak Grove Formation
Natica (*Cryptonatica*) sp. cf. *N.* (*C.*) *platabasis* Gardner mss	Chipola formation
Calliostoma sp. ind. cf. *C. aphelium* Dall	Jones Wharf and Calvert Cliffs, Md.
Calliostoma sp.	
Scapharca staminata Dall?	Chipola formation including the "Sopchoppy limestone"
Ostrea normalis Dall	Chipola formation ("Sopchoppy limestone" and "Hawthorn beds")
Pecten acanikos Gardner	Chipola formation including the "Sopchoppy limestone"
Carolia floridana Dall	Chipola formation ("Sopchoppy limestone")
Mytilis conradinus d'Orbigny?	Chipola formation ("Sopchoppy limestone")
Astarte sp. ind.	
Venericardia (*Pteromeris*) sp. ind. cf. *V.* (*P.*) *perplana abbreviata* Conrad?	
Phacoïdes (*Parvilucina*) *trisulcatus* Conrad?	Chipola formation including the "Sopchoppy limestone"
Phacoïdes (*Parvilucina*) sp. cf. *P.* (*P.*) *piluliformis* Dall	Oak Grove Formation
Phacoïdes (*Here*) sp. cf. *P.* (*H.*) *parawhitfieldi* Gardner mss	Oak Grove Formation
Cardium sp. ind.	
Dosinia sp. cf. *D. chipolana* Dall	Chipola formation including the "Sopchoppy limestone"
Macrocallista sp. ind.	
Strigilla n. sp.	
Donax n. sp.	
Mactra sp. ind.	
Spisula n. sp.	
Corbula n. sp.	
Balanus sp.	

revisions required by our increased knowledge of the lower Miocene fauna.

The affinities of the Marks Head fauna, particularly of the dominant elements, are so clearly defined that they offer little ground for discussion. Possibly the late Chipola coast in the Floridian region was outlined by sand bars and spits similar to those off the east coast today and the partial isolation offered by those inlets and bays may account for the provincial character of the late Chipola faunas.

The Chipola fauna seems to have been much more widely distributed than might be expected from its sketchy occurrence in the environs of the type locality. It has been recognized at a depth of 4325 feet to 4511 feet in the well at Brownsville, Texas, and even so far south as Tampico. The northward extension of the fauna, however, is of particular interest since it approximates the margin of another faunal province.

SCIENTIFIC NOTES AND NEWS

Dr. L. Silberstein lectured at the Laboratory of the Department of Terrestrial Magnetism, Carnegie Institution, on April 29, on the subject *Some Cosmological consequences of the finite universe.*

The annual field excursion of the Petrologists Club took place on Saturday, May 9. The feldspar quarries northwest of Ellicott City, Maryland, which locally show the alteration of orthoclase to albite, were visited.

Dr. E. A. Eckhardt, who for six years has been in charge of the Sound Laboratory of the Bureau of Standards, has resigned this position to join the staff of the newly organized research department of the Marland Oil Company of Oklahoma.

Dr. S. F. Blake, of the Bureau of Plant Industry, is spending several weeks at museums in Paris, Geneva and London for the purpose of studying type specimens of certain American species of plants.

Mrs. Agnes Chase, agrostologist of the Department of Agriculture, returned recently from an extended trip to Brazil. Over 2300 specimens of plants were collected, chiefly near Pernambuco, Bahia, Minas Geraes, Rio de Janeiro and on Mt. Itatiaya.

Through the efforts of Dr. William Schaus of the Division of Insects, U. S. National Museum, the large collection of lepidoptera of Paul Dognin, Les Pipots, France, has been purchased and presented to the National Museum. This collection contains over eighty thousand specimens of moths and butterflies, a large number of which are types of American species.

S. H. Cathcart, geologist of the Geological Survey, has resigned to engage in geological work in Argentina.

John S. Brown, geologist of the Geological Survey, has resigned to engage in commercial work.